Appendix 6A
Carbon Balance

1. Introduction

1.1.1 The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017[1] require consideration of the impact of the Proposed Development on climate (for example the nature and magnitude of greenhouse gas (GHG) emissions) and the vulnerability of the Proposed Development to climate change (climate change resilience (CCR)).

1.1.2 This appendix reports on the carbon balance calculation that has been completed for the Proposed Development. The assessment determines the benefit of the Proposed Development in terms of reduced carbon emissions compared to a reference energy mix. This is considered in the context of carbon budgets and targets for Scotland and the UK, aligned to a trajectory compatible with limiting the increase in global average temperature below 1.5°C. This includes consideration of GHG emissions in the production, transportation, erection, operation and decommissioning phases of the Proposed Development.

1.1.3 Given the inherent carbon benefit of wind farms, a standalone GHG EIA Report chapter is not required. The Scottish Government Carbon Calculator Tool[2] has been used for the carbon balance calculation. The Carbon Calculator Tool is designed for applications for the construction and operation of onshore windfarms in Scotland located where peat is present. The wind farm layout, design and construction methodology has been refined to minimise peat excavation from tracks and turbine infrastructure, but it has not been possible to avoid it entirely. A draft Peat Management Plan (PMP) has been prepared (**Appendix 6B**) which demonstrates how excavated peat can be reinstated within the Development Site following construction.

1.2 Climate change resilience (CCR)

1.2.1 A standalone assessment of CCR has not been completed as part of the EIA, as the vulnerability of the Proposed Development to climate change will be addressed through the design process with measures to improve the resilience. Climate change impacts will be considered within the detailed design of the Proposed Development where appropriate. The design of the Proposed Development will consider climate projections for a variety of environmental parameters (e.g. extreme rainfall, temperature, drought etc.) to ensure that appropriate mitigation measures are embedded within the design. The worst-case climatic conditions at the end of the design life of the Proposed Development will be considered.

[1] *The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017* [online]. Available at: https://www.legislation.gov.uk/ssi/2017/101/contents/made [Accessed 19 October 2022].
[2] Scottish Environment Protection Agency (2020). *Carbon Calculator Tool v1.6.1* [online]. Available at: https://informatics.sepa.org.uk/CarbonCalculator/index.jsp [Accessed 19 October 2022].

2. Renewable Energy Policy Context

2.1.1 **Chapter 6: Renewable Energy** provides an overview of the applicable renewable energy policy and strategies that the proposals should have regard to. This includes the relevant UK wide and Scottish legislative and policy framework for the development of renewable energy schemes. Current legislation, national policies, and local policy and guidance recognise climate change as a pressing concern. GHG emissions are expected and required to reduce in the future.

2.1.2 The approach taken by the UK and Scotland to addressing climate change has been shaped and informed by a range of international agreements and climate change obligations including the Kyoto Protocol[3], the Paris Agreement[4] and the 2021 Glasgow Climate Compact[5] reflecting the UK's role as a signatory to the United Nations Framework Convention on Climate Change (UNFCCC).

2.1.3 The UK Government has set a net zero target which requires the UK to reduce GHG emissions by 100% below 1990 levels by 2050[6], this being the UK position in terms of meeting international obligations to reduce carbon emissions. The Scottish Government has set a net zero target which requires Scotland to reduce GHG emissions by 100% below 1990 levels by 2045[7].

[3] UNFCC (1998). *Kyoto Protocol* [online]. Available at: https://unfccc.int/resource/docs/convkp/kpeng.pdf [Accessed 19 October 2022].
[4] UNFCC (2015). *Paris Agreement* [online]. Available at: https://unfccc.int/sites/default/files/english_paris_agreement.pdf [Accessed 19 October 2022].
[5] UNFCC (2021). *Glasgow Climate Pact* [online]. Available at: https://unfccc.int/sites/default/files/resource/cop26_auv_2f_cover_decision.pdf [Accessed 19 October 2022].
[6] *The Climate Change Act 2008 (2050 Target Amendment) Order 2019* [online]. Available at: https://www.legislation.gov.uk/uksi/2019/1056/contents/made [Accessed 19 October 2022].
[7] *Climate Change (Emissions Reduction Targets) (Scotland) Act 2019* [online]. Available at: https://www.legislation.gov.uk/asp/2019/15/contents/enacted [Accessed 19 October 2022].

3. Scope and Receptors

3.1.1 The scope of the assessment of GHG emissions associated with the Proposed Development includes GHG emissions from all activities within the Development Site, arising from the construction, operation, maintenance and decommissioning phases, as well as the GHG emissions associated with material processing and transportation of materials and labour outside of the Development Site.

3.1.2 GHG emissions have a global effect rather than directly affecting any specific local receptor to which a level of sensitivity can be assigned. The global climate is the only receptor for the climate change assessment.

3.1.3 Given the global impacts of climate change and the globally recognised requirement to limit GHG emissions to maintain global average temperature increase below 1.5°C to 2°C, as laid out in the Paris Agreement[4], the receptor is considered highly sensitive to GHG emissions.

4. Potential Energy Contribution of the Proposed Development to Government Objectives

4.1 Energy Yield

4.1.1 The installed capacity of a wind turbine is a measure of its maximum rated output, which in the context of the Proposed Development is an estimated 96 MW (assuming 15 x 6.4 MW machines[8]). Calculations of the likely electricity generation of the turbines are dependent on the 'capacity factor', which involves an assessment of the actual output of the Proposed Development against its installed capacity[9].

4.1.2 On this basis, and with an estimated installed capacity of 96 MW, the amount of electricity to be produced by the Proposed Development has been estimated to be 218.65 GWh per year, using the rolling Scottish average (for the last 5 years)[10] capacity factor of 26%. It should be noted that site specific data has shown the actual capacity factor would be higher than this[11].

4.1.3 This 26% capacity factor has been used to calculate potential annual energy yield for the Proposed Development, shown in **Table 4.1**.

4.2 Carbon Dioxide Savings and Electricity Generation

4.2.1 It is widely accepted that electricity produced from wind energy has a positive benefit with regard to reducing carbon dioxide (CO2) emissions. However, there has been much debate about the actual level of emissions savings that might arise from a wind farm development.

4.2.2 In estimating the actual saving it is important to consider the mix of alternative sources of electricity generation, for example, coal, oil and gas powered. Digest of UK Energy Statistics (DUKES) (July 2022) sets the static figure of emission related with electricity generated by 'all non-renewable fuels' at 432 tonnes of CO_2 for every GWh generated[12]. A figure of tonnes of CO_2 for every GWh has therefore been assumed for the purposes of this assessment, with savings of CO_2 estimated on the basis of a range of capacity factors.

[8] The specific choice of wind turbine to be installed is dependent on the final commercial and technical choice by the Applicant. The anticipated power rating of 1 turbine is in the range 6.2 MW to 6.6 MW. 6.4 MW has been used for a conservative calculation of potential electricity generation and CO_2 savings.

[9] The net capacity factor of a wind farm is the ratio of its actual energy output (after energy losses within the wind farm have been accounted for) over a defined period of time (typically a year) to its energy output, had it operated at maximum power output continuously, over the same period of time.

[10] BEIS (2022) *Long term average figures for Scotland and the UK - Energy Trends Section 6: Renewables (ET6.1 Renewable Electricity Capacity and Generation, September 2021. Capacity factor for Scotland* [online]. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/437811/et6_1.xls [Accessed 19 October 2022].

[11] 37.4% capacity factor determined by several years of onsite monitoring for the range of turbines being considered.

[12] Renewable UK (2022). *Wind Energy Statistics Explained* [online]. Available at: https://www.renewableuk.com/page/UKWEDExplained [Accessed 15 September 2022].

4.2.3 The Department of Business, Energy and Industrial Strategy (BEIS) produces a range of statistics detailing electricity consumption across the UK. The average domestic consumption in the UK, was 3,880 kWh per household in 2020[13].

4.2.4 The electricity generated by the Proposed Development will enter the National Grid, and therefore cannot be tracked to the individual consumer. Therefore, it is relevant to consider electricity demand in the context of UK as a whole, rather than within the area surrounding the Proposed Development.

4.2.5 The potential electricity generation and 'Homes Equivalent' electricity generation (based on 3,880 kWh annual domestic consumption in UK) are provided in **Table 4.1.** The potential CO_2 savings as a result of the Proposed Development generating electricity instead of conventional power stations, with an assumed 432 tonnes of CO_2 for every GWh generated, are also presented.

Table 4.1 Potential electricity generation and CO2 savings

Capacity factor (%)	Electricity generation (MWh per year)[14]	Homes equivalent (based on average consumption)[13]	CO_2 savings (Tonnes of CO_2 per year) based on Renewable UK savings figure[1212]
37.4% (site-specific)	314,519	81,062	135,872
26.0% (Scottish average)	218,650	56,353	94,457

[13] BEIS (2022). *Energy consumption in the UK 2021 – July 2022 update* [online]. Available at: https://www.gov.uk/government/statistics/energy-consumption-in-the-uk-2021 [Accessed 15 September 2022].
[14] Figures are derived as follows: 96 MW × 8,760 hours/year × 0.26 (capacity factor) = 218,650 MWh.

5. Carbon Balance of the Proposed Development

5.1 Overview

5.1.1 The following sections outline the specific values for the carbon losses and carbon gains associated with the Proposed Development. For each input parameter (as outlined in **Annex A** to this document), an expected, minimum and maximum value is required to provide an expected, minimum and maximum scenario for the carbon payback.

5.1.2 For this application, version 1.6.1 of the online Scottish Government Carbon Calculator Tool[2] was used on 01 November 2022, the reference number is not supplied in this document, but has been communicated separately to relevant consultees.

5.1.3 A table containing the values for each scenario and the justification for the values used for the carbon balance calculations is found at **Annex A.**

5.2 Carbon Losses

5.2.1 The manufacturing, construction and installation (including concrete) of the wind turbines at the Proposed Development has an associated carbon cost. Using figures from the online calculator, the expected case carbon emission losses associated with the manufacture, construction and decommissioning of the 96 MW installed capacity, is 86,508 t CO_2 equivalent (t CO_2e), which equates to approximately 43% of total CO_2 losses.

5.2.2 The carbon payback model attributes carbon losses due to the requirement for extra capacity to back up wind power generation at times of peak demand. This is quantified as a percentage of total capacity, which was input as 5% for this case (the recommended figure within the model) and equates to 66,226 t CO_2e (i.e. approximately 33% of total CO_2 losses).

5.2.3 Peatlands are a high conservation priority because of their function in storing carbon in addition to their biodiversity value. The Proposed Development has therefore been designed to avoid areas of deeper peat as far as possible, allowing for all other environmental and engineering constraints. Nevertheless, the construction will involve disturbance of a volume of peat. This is quantified within a PMP (**Appendix 6B**), which sets out a series of control measures for in-situ peat protection, peat stripping and excavation, temporary peat stockpiling and reinstatement to ensure that impacts upon excavated peat will be minimised. The PMP also demonstrates how all excavated peat can be beneficially re-used within the Development Site following construction.

5.2.4 Carbon losses associated with CO_2 release from soil organic matter for the expected case amount to 45,322 t CO_2e which equates to approximately 23% of total CO_2 losses. These losses result from peat removal and drainage effects following excavation for items of infrastructure, notably turbine foundations, hard standings and access tracks, as well as borrow pits. It is worth noting that this figure assumes 100% loss of CO_2 from removed/disturbed peat, as this is the default value within the carbon model and cannot be amended. In reality, losses are likely to be considerably less than this, as it is expected that the full amount of the disturbed peat would be used in reinstating the Development Site (see **Appendix 6B**).

5.2.5 Small carbon losses are generated by the reduction of carbon fixing potential which occurs due to the loss of bog plants as a result of wind farm construction. For the expected case, this is 1,580 t CO_2e, which equates to 1% of total CO_2 losses.

5.2.6 Total CO_2 losses due to the Proposed Development are 199,635 t CO_2e.

5.3 Carbon Gains

5.3.1 There are small carbon gains due to reinstatement of peat within borrow pits.

6. Carbon Payback of the Proposed Development

6.1.1 To calculate the carbon payback period, the online calculator uses three different fossil fuel displacement scenarios, which are updated automatically using data from DUKES:

- Grid mix, the mix of electricity sources supplying the UK as a whole;
- Coal fired for coal fired electricity generation; and
- Fossil fuel mix for fossil fuel sourced electricity generation alone.

6.1.2 The carbon calculator[15] recommends using the fossil fuel sourced grid mix scenario as the most appropriate for calculating the carbon payback time (the counterfactual)[16]. Based on this scenario, the payback for the Proposed Development is predicted to be 1.4 years for the expected outcome. The payback period could be as low as 0.6 years for the minimum scenario but increases to 2.6 years for the maximum scenario for fossil fuel mix and 4.7 years for grid mix.

6.1.3 The carbon payback time for each scenario is shown in **Table 6.1**.

Table 6.1 Payback in years for each scenario used in the carbon calculator

Fuel source	Carbon payback time (years) Expected value	Carbon payback time (years) Minimum value	Carbon payback time (years) Maximum Value
Coal fired	0.7	0.3	1.3
Grid mix	2.5	1.1	4.7
Fossil fuel mix	1.4	0.6	2.6

[15] Scottish Environment Protection Agency (n.d.) *Carbon Calculator: technical guidance* [online]. Available at: https://www.gov.scot/publications/carbon-calculator-technical-guidance/ [Accessed 27 October 2022].
[16] Note on limitations: wind power will not replace all forms of conventional generation equally, so the true carbon emissions displacement will be dependent on a combination of factors e.g. the types of power generation being replaced, any decrease in efficiency of conventional plant operating at part load, and the impact of any increase in frequency of start-up and shut-down of conventional plant.

7. Summary

7.1.1 On the basis of potential annual CO_2 savings of 135,872 tonnes/year (based on figure of 432 tonnes of CO_2 savings per GWh and a capacity factor of 37.4%), the Proposed Development could result in a total carbon saving of approximately 4.8 M tonnes over its 35-year operational life and generate electricity to annually supply the equivalent of 81,062 homes.

7.1.2 It is predicted that the carbon loss in developing the Proposed Development would be paid back in ~1.4 years (4% of the 35-year operational life) based upon the expected outcome under the fossil fuel mix scenario. Even considering the maximum scenario against the fossil fuel mix, the Proposed Development would have achieved the carbon balance within ~2.6 years (7% of the 35-year operational life).

7.1.3 It is concluded that the GHG impact of the Proposed Development will have a significant beneficial effect. The Proposed Development causes an indirect reduction in atmospheric GHG emissions which has a positive impact on achievement of carbon budgets and targets for Scotland and the UK, and a 1.5°C compatible trajectory.

Annex A
Carbon Calculator - Justification for Values Used

Core input data

Input data	Expected value	Minimum value	Maximum value	Source of data
Windfarm characteristics				
Dimensions				
No. of turbines	15	15	15	Chapter 3 - Description of the Proposed Development: 3.2.7 number of turbines included in Proposed Development.
Duration of consent (years)	35	35	35	Chapter 3 - Description of the Proposed Development: 3.7.2 operational lifetime is 35 years.
Performance				
Power rating of 1 turbine (MW)	6.4	6.2	6.6	Client has confirmed 6.2-6.6 MW. Assumed expected as 6.4 MW.
Capacity factor	37.4	32.1	40.4	Capacity factor determined by several years of onsite monitoring for the range of turbines being considered. 2019 FEI Appendix V6A.
Backup				
Fraction of output to backup (%)	5	0	5	Following the guidance provided by Nayak et al, UK Energy in brief 2013 confirms that wind energy accounts for less than 20% of total national electricity generation therefore 0% could be used however 5% has been used to reflect a worst case

Input data	Expected value	Minimum value	Maximum value	Source of data
				scenario 0% is entered as a minimum value.
Additional emissions due to reduced thermal efficiency of the reserve generation (%)	10	10	10	Fixed
Total CO_2 emission from turbine life ($tCO2\ MW^{-1}$) (e.g. manufacture, construction, decommissioning)	Calculate wrt installed capacity	Calculate wrt installed capacity	Calculate wrt installed capacity	
Characteristics of peatland before windfarm development				
Type of peatland	Acid bog	Acid bog	Acid bog	"An 'acid bog' is fed primarily by rainwater and often inhabited by sphagnum moss, thus making it acidic. See Stoneman & Brooks (1997). A 'fen' is a type of wetland fed by surface and/or groundwater. See McBride et al. (2011). Bog or ombrogenous mire: A peatland that is raised above the surrounding landscape and that receives water only from precipitation. Fen or geogenous mire: A peatland that is situated in a depression and receives water that has been in contact with mineral bedrock or soil.
Average annual air temperature at site (°C)	13.04	5.1	14.01	Average annual temperature taken for Glenlee Met Office station 1991-2020 (~20 km from the Development Site). Expected value calculated using average of minimum and maximum average temperatures.
Average depth of peat at site (m)	0.66	0.46	0.95	Values taken from Lorg Windfarm mean peat values spread sheet. Averages of all infrastructure locations.
C Content of dry peat (% by weight)	55	49	62	Calculated using typical values provided in carbon calculator tool.

Input data	Expected value	Minimum value	Maximum value	Source of data
Average extent of drainage around drainage features at site (m)	7.5	5	10	No site specific measurements available, precautionary values used.
Average water table depth at site (m)	0.3	0.2	0.4	Expected value is average across all 1,078 measurements taken at site where water table depth is estimated to be equivalent to catotelm thickness. Detailed water table depth measurements were not taken.
Dry soil bulk density (g cm^{-3})	0.25	0.2	0.3	Due to lack of site specific information, indicative figures from National Soil Inventory of Scotland have been used
Characteristics of bog plants				
Time required for regeneration of bog plants after restoration (years)	3	2	5	Estimated values.
Carbon accumulation due to C fixation by bog plants in undrained peats (tC ha^{-1} yr^{-1})	0.25	0.12	0.31	Default values provided by Turunen et al., 2001; Botch et al., 1995.
Forestry Plantation Characteristics				
Area of forestry plantation to be felled (ha)	0	0	0	Chapter 3 - Description of the Proposed Development: 3.2.3 the site has no tree cover - no forestry felling is expected.
Average rate of carbon sequestration in timber (tC ha^{-1} yr^{-1})	0	0	0	Chapter 3 - Description of the Proposed Development: 3.2.3 the site has no tree cover - no forestry felling is expected.
Counterfactual emission factors				

Input data	Expected value	Minimum value	Maximum value	Source of data
Coal-fired plant emission factor (t CO2 MWh^{-1})	0.92	0.92	0.92	
Grid-mix emission factor (t CO2 MWh^{-1})	0.25358	0.25358	0.25358	
Fossil fuel-mix emission factor (t CO2 MWh^{-1})	0.45	0.45	0.45	
Borrow pits				
Number of borrow pits	2	2	2	Chapter 3 - Description of the Proposed Development: Table 3.1 - 2 borrow pits proposed.
Average length of pits (m)	100	80	120	Values taken from Lorg Windfarm mean peat values spread sheet. Minimum and maximum entered as a 20% range to allow for variations.
Average width of pits (m)	20	20	20	Values taken from Lorg Windfarm mean peat values spread sheet.
Average depth of peat removed from pit (m)	0.47	0.02	1.58	Values taken from Lorg windfarm mean peat values spread sheet.
Access tracks				
Total length of access track (m)	18100	14480	21720	Chapter 3 - Description of the Proposed Development: 3.2.21 internal wind farm tracks. Minimum and maximum entered as a 20% range to allow for variations.
Existing track length (m)	0	0	0	No existing track on site.
Length of access track that is floating road (m)	4960	3968	5952	Chapter 3 - Description of the Proposed Development: 3.2.24 Minimum and maximum entered as a 20% range to allow for variations.
Floating road width (m)	6	5	8	Chapter 3 - Description of the Proposed Development: 3.2.22

Input data	Expected value	Minimum value	Maximum value	Source of data
				width of access tracks. Max 8 m (the actual figure may be 14 m at certain locations such as passing places).
Floating road depth (m)	0	0	0.5	Peat depth displaced, worst case allows for some sinkage.
Length of floating road that is drained (m)	0	0	0	No drains would be used alongside a floating road.
Average depth of drains associated with floating roads (m)	0	0	0.5	Assume no drains required alongside floating roads. Maximum drain depth of 0.5m required for worst case scenario.
Length of access track that is excavated road (m)	13140	10512	15768	Chapter 3- Description of the Proposed Development. All access track is new and so excavated track calculated by subtracting floating track from total track. Minimum and maximum entered as a 20% range to allow for variations.
Excavated road width (m)	6	5	8	Chapter 3 - Description of the Proposed Development: 3.2.22 width of access tracks. Max 8 m (the actual figure may be 14 m at certain locations such as passing places).
Average depth of peat excavated for road (m)	0.45	0.32	0.60	Values taken from Lorg windfarm mean peat values spread sheet.
Length of access track that is rock filled road (m)	0	0	0	Chapter 3 - Description of the Proposed Development: Table 3.4 no rock filled road.
Rock filled road width (m)	5	5	5	Chapter 3 - Description of the Proposed Development: Table 3.4 no rock filled road.
Rock filled road depth (m)	0	0	0	Chapter 3 - Description of the Proposed Development: Table 3.4 no rock filled road.

Input data	Expected value	Minimum value	Maximum value	Source of data
Length of rock filled road that is drained (m)	0	0	0	Chapter 3 - Description of the Proposed Development: Table 3.4 no rock filled road.
Average depth of drains associated with rock filled roads (m)	0	0	0	Chapter 3 - Description of the Proposed Development: Table 3.4 no rock filled road.
Cable trenches				
Length of any cable trench on peat that does not follow access tracks and is lined with a permeable medium (e.g. sand) (m)	0	0	0	Chapter 3 - Description of the Proposed Development: 3.2.36 Assume full length of cable route to follow access track.
Average depth of peat cut for cable trenches (m)	0.69	0.53	0.86	Values taken from Lorg windfarm mean peat values spread sheet. Assume as for access roads given that cable trenches will be alongside.
Additional peat excavated (not already accounted for above)				
Volume of additional peat excavated (m^3)	48449	28893	71714	Values taken from Lorg windfarm mean peat values spread sheet.
Area of additional peat excavated (m^2)	69470	55576	83364	Chapter 3 - Description of the Proposed Development: Table 3.1: 2x temporary construction compounds, substations A and B, Met masts and crane pads. Minimum and maximum entered as a 20% range to allow for variations. Added blade storage areas.
Peat Landslide Hazard				
Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments	negligible	negligible	negligible	Fixed

Input data	Expected value	Minimum value	Maximum value	Source of data
Improvement of C sequestration at site by blocking drains, restoration of habitat etc				
Improvement of degraded bog				
Area of degraded bog to be improved (ha)	0	0	0	No bog restoration works proposed other than those in the borrow pit.
Water table depth in degraded bog before improvement (m)	0	0	0	No bog restoration works proposed other than those in the borrow pit.
Water table depth in degraded bog after improvement (m)	0	0	0	No bog restoration works proposed other than those in the borrow pit.
Time required for hydrology and habitat of bog to return to its previous state on improvement (years)	2	2	2	No bog restoration works proposed other than those in the borrow pit.
Period of time when effectiveness of the improvement in degraded bog can be guaranteed (years)	2	2	2	No bog restoration works proposed other than those in the borrow pit.
Improvement of felled plantation land				
Area of felled plantation to be improved (ha)	0	0	0	Chapter 3 - Description of the Proposed Development: 3.2.3 the site has no tree cover - no forestry felling is expected.
Water table depth in felled area before improvement (m)	0	0	0	Chapter 3 - Description of the Proposed Development: 3.2.3 the site has no tree cover - no forestry felling is expected.
Water table depth in felled area after improvement (m)	0	0	0	Chapter 3 - Description of the Proposed Development: 3.2.3 the site has no tree cover - no forestry felling is expected.

Input data	Expected value	Minimum value	Maximum value	Source of data
Time required for hydrology and habitat of felled plantation to return to its previous state on improvement (years)	2	2	2	Chapter 3 - Description of the Proposed Development: 3.2.3 the site has no tree cover - no forestry felling is expected.
Period of time when effectiveness of the improvement in felled plantation can be guaranteed (years)	2	2	2	Chapter 3 - Description of the Proposed Development: 3.2.3 the site has no tree cover - no forestry felling is expected.
Restoration of peat removed from borrow pits				
Area of borrow pits to be restored (ha)	0.4	0.3	0.5	Chapter 3 - Description of the Proposed Development: 3.5.62 an appropriate restoration plan for the borrow pits will be developed. Minimum and maximum entered as a 20% range to allow for variations.
Depth of water table in borrow pit before restoration with respect to the restored surface (m)	0.3	0.2	0.4	Estimated water table depth in borrow pit before restoration, Using average water table depth.
Depth of water table in borrow pit after restoration with respect to the restored surface (m)	0.25	0.15	0.35	Restored water table depth expected, estimated value entered.
Time required for hydrology and habitat of borrow pit to return to its previous state on restoration (years)	10	8	12	Expected case based upon estimations provided by RSPB in their response to the application (2019 FEI Appendix V6A). Minimum and maximum entered as a range.
Period of time when effectiveness of the restoration of peat removed from borrow pits can be guaranteed (years)	25	23	27	The restoration measures are expected to last the lifetime of the wind farm (i.e. following restoration to previous state.)

Input data	Expected value	Minimum value	Maximum value	Source of data
Early removal of drainage from foundations and hardstanding				
Water table depth around foundations and hardstanding before restoration (m)	0	0	0	Assumed no removal of drainage.
Water table depth around foundations and hardstanding after restoration (m)	0	0	0	Assumed no removal of drainage.
Time to completion of backfilling, removal of any surface drains, and full restoration of the hydrology (years)	0.1	0.1	0.1	Assumed no removal of drainage.
Restoration of site after decommissioning				
Will the hydrology of the site be restored on decommissioning?	No	No	No	
Will you attempt to block any gullies that have formed due to the windfarm?	Yes	Yes	No	Assumes that any gullies caused by construction of the wind farm would be blocked to maintain habitats except worst case scenario (maximum column).
Will you attempt to block all artificial ditches and facilitate rewetting?	No	No	No	Assumed no.
Will the habitat of the site be restored on decommissioning?	No	No	No	
Will you control grazing on degraded areas?	Yes	Yes	Yes	If required.
Will you manage areas to favour reintroduction of species	No	No	No	Assumed no.

Input data	Expected value	Minimum value	Maximum value	Source of data
Methodology				
Choice of methodology for calculating emission factors	Site specific (required for planning applications)			

Forestry input data

N/A

Construction input data

Input data	Expected value	Minimum value	Maximum value	Source of data
Area 1				
Number of turbines in this area	5	5	5	Values taken from Lorg windfarm mean peat values spread sheet.
Turbine foundations				
Depth of hole dug when constructing foundations (m)	0.28	0.17	0.39	Values taken from Lorg windfarm mean peat values spread sheet.
Approximate geometric shape of whole dug when constructing foundations	Circular	Circular	Circular	Chapter 3 - Description of the Proposed Development: Table 3.1 - 25m diameter foundation. Maximum excavation depth of 3 m and typical batter slope of 45 degrees for the excavation, the diameter of the excavated area at the surface will be 34 m.
Diameter at bottom	25	25	25	
Diameter at surface	34	34	34	
Hardstanding				
Depth of hole dug when constructing hardstanding (m)	0.33	0.23	0.43	Values taken from Lorg windfarm mean peat values spread sheet.
Approximate geometric shape of whole dug when constructing hardstanding	Rectangular	Rectangular	Rectangular	Values taken from Lorg windfarm mean peat values spread sheet. Total hardstanding per turbine ~1,500m^2.
Length at surface	39	39	39	
Width at surface	38	38	38	

Input data	Expected value	Minimum value	Maximum value	Source of data
Length at bottom	39	39	39	
Width at bottom	38	38	38	
Piling				
Is piling used?	No	No	No	Chapter 3 - Description of the Proposed Development: 3.5.27 the use of piled foundations has not been considered in the EIA.
Volume of Concrete				
Volume of concrete used (m^3) in the entire area	4033	3226	4839	Chapter 3 - Description of the Proposed Development: Table 3.7 estimated total volume of concrete 12,098m3 - scaled based on turbine number in area. Minimum and maximum entered as a 20% range to allow for variations.

Input data	Expected value	Minimum value	Maximum value	Source of data
Area 2				
Number of turbines in this area	7	7	7	Values taken from Lorg windfarm mean peat values spread sheet.
Turbine foundations				
Depth of hole dug when constructing foundations (m)	0.82	0.49	1.24	Values taken from Lorg windfarm mean peat values spread sheet.
Approximate geometric shape of whole dug when constructing foundations	Circular	Circular	Circular	Chapter 3 - Description of the Proposed Development: Table 3.1 - 25m diameter foundation. Maximum excavation depth of 3 m and typical batter slope of 45 degrees for the excavation, the diameter of the excavated area at the surface will be 34 m.
Diameter at bottom	25	25	25	
Diameter at surface	34	34	34	
Hardstanding				
Depth of hole dug when constructing hardstanding (m)	0.91	0.7	1.14	Values taken from Lorg windfarm mean peat values spread sheet.
Approximate geometric shape of whole dug when constructing hardstanding	Rectangular	Rectangular	Rectangular	Values taken from Lorg windfarm mean peat values spread sheet. Total hardstanding per turbine ~1,500m2.

Input data	Expected value	Minimum value	Maximum value	Source of data
Area 2				
Length at surface	39	39	39	
Width at surface	38	38	38	
Length at bottom	39	39	39	
Width at bottom	38	38	38	
Piling				
Is piling used?	No	No	No	Chapter 3 - Description of the Proposed Development: 3.5.27 the use of piled foundations has not been considered in the EIA.
Volume of Concrete				
Volume of concrete used (m^3) in the entire area	5646	4517	6775	Chapter 3 - Description of the Proposed Development: Table 3.7 estimated total volume of concrete 12,098m^3 - scaled based on turbine number in area. Minimum and maximum entered as a 20% range to allow for variations.

Input data	Expected value	Minimum value	Maximum value	Source of data
Area 3				
Number of turbines in this area	3	3	3	Values taken from Lorg windfarm mean peat values spread sheet.
Turbine foundations				
Depth of hole dug when constructing foundations (m)	1.38	0.63	2.07	Values taken from Lorg windfarm mean peat values spread sheet.
Approximate geometric shape of whole dug when constructing foundations	Circular	Circular	Circular	Chapter 3 - Description of the Proposed Development: Table 3.1 - 25m diameter foundation. Maximum excavation depth of 3 m and typical batter slope of 45 degrees for the excavation, the diameter of the excavated area at the surface will be 34 m.
Diameter at bottom	25	25	25	
Diameter at surface	34	34	34	
Hardstanding				
Depth of hole dug when constructing hardstanding (m)	1.25	0.95	1.55	Values taken from Lorg windfarm mean peat values spread sheet.

Input data	Expected value	Minimum value	Maximum value	Source of data
Area 3				
Approximate geometric shape of whole dug when constructing hardstanding	Rectangular	Rectangular	Rectangular	Values taken from Lorg windfarm mean peat values spread sheet. Total hardstanding per turbine ~1,500m².
Length at surface	39	39	39	
Width at surface	38	38	38	
Length at bottom	39	39	39	
Width at bottom	38	38	38	
Piling				
Is piling used?	No	No	No	Chapter 3 - Description of the Proposed Development: 3.5.27 the use of piled foundations has not been considered in the EIA.
Volume of Concrete				
Volume of concrete used (m^3) in the entire area	2420	1936	2904	Chapter 3 - Description of the Proposed Development: Table 3.7 estimated total volume of concrete 12,098m³ - scaled based on turbine number in area. Minimum and maximum entered as a 20% range to allow for variations.